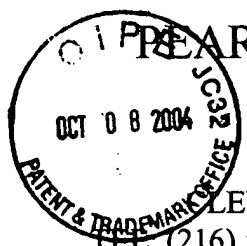


2 of c

CHARLES B. GORDON
THOMAS P. SCHILLER
DAVID B. DEIOMA
JOSEPH J. CORSO
HOWARD G. SHIMOLA
JEFFREY J. SOPKO
JOHN P. MURTAUGH
JAMES M. MOORE
MICHAEL W. GARVEY
RICHARD A. SHARPE
RONALD M. KACHMARIK
PAUL A. SERBINOWSKI



PEARNE & GORDON LLP

ATTORNEYS AT LAW

1801 EAST 9th STREET

SUITE 1200

CLEVELAND, OHIO 44114-3108

TEL: (216) 579-1700

FAX: (216) 579-6073

EMAIL: ip@pearnegordon.com

STEPHEN S. WENTSLER
BRIAN G. BEMBENICK
AARON A. FISHMAN
ROBERT F. BODI
SUZANNE B. GAGNON
UNA L. LAURICIA
STEVEN J. SOLOMON
GREGORY D. FERNENGEL
OF COUNSEL
LOWELL L. HEINKE
THADDEUS A. ZALENSKI

PATENT, TRADEMARK,
COPYRIGHT AND RELATED
INTELLECTUAL PROPERTY LAW

October 6, 2004

Mail Stop Certificate of Corrections Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Certificate
OCT 15 2004
of Correction

Re: U.S. Patent No.: 6,789,491 B2
Issued: September 14, 2004
Inventor: Yoshiaki Takahashi et al.
Our Docket: 33463

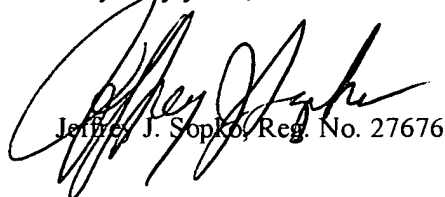
Sir:

A Certificate of Correction under 35 U.S.C. 254 is hereby requested to correct Patent Office printing errors in the above-identified patent. Enclosed herewith is a proposed Certificate of Correction (Form No. PTO-1050) for consideration along with appropriate documentation supporting the request for correction.

It is requested that the Certificate of Correction be completed and mailed at an early date to the undersigned attorney of record. The proposed corrections are obvious ones and do not in any way change the sense of the application.

We understand that a check is not required since the errors were on the part of the Patent and Trademark Office in printing the patent.

Very truly yours,


Jeffrey J. Sopko, Reg. No. 27676

JJS:vlm
Enclosures

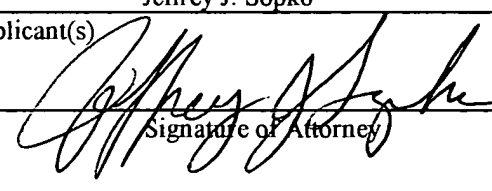
I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below.

Jeffrey J. Sopko

Name of Attorney for Applicant(s)

October 6, 2004

Date


Signature of Attorney

18 OCT 2004

18 OCT 2004

18 OCT 2004

18 OCT 2004

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**

PATENT NO. : 6,789,491 B2
DATED : September 14, 2004
INVENTOR(S) : Yoshiaki Takahashi et al.

PAGE 1 OF 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 27

Line 8, after "a circulating flow", please delete "r", and insert therefor - - Γ - -.

Column 31

Line 30, please delete "mild" and insert therefor - - fluid - -.

MAILING ADDRESS OF SENDER: Jeffrey J. Sopko
Pearne & Gordon LLP
1801 East 9th Street
Suite 1200
Cleveland, Ohio 44114-3108

PATENT NO. 6,789,491 B2

No. of additional copies

⇒ 0

18 OCT 2004



pressure gradient force such that, the seawater is discharged from the fluid passage 36 and the air flowing in from the air intake opening 21a is ejected into the water by flowing through the fluid passage 36. Then, the gas delivered into the water becomes mixed in the water as air bubbles 42, and numerous intervening bubbles 42 in the vicinity of the submerged surface 12 gather in the vicinity of the submerged surface 12 of the ship body 10 to lead to reduction in the frictional resistance of the ship body 10.

The energy required to push the air into the water is primarily the energy for changing the position of the air. This energy is obtained by varying the flowing condition of the water by using the inclined surface 24 of the flow guiding body 20 protruding from the submerged surface 12, and is less than the energy consumed in compressing the air and ejecting the compressed air into the water. For this reason, the energy expended in cruising is effectively reduced by lowering the frictional resistance of the ship body 10.

Also, in this embodiment, the acute angle of protrusion of the lateral surface 25 causes not only stream separation but also cavitation. For this reason, gas and water are mixed intimately at the interface between the gas phase and the liquid phase due to the stirring actions caused by the separation region and cavitation to promote detachment of the bubbles 42 from the gas/liquid interface.

Further, in this embodiment, the wings 30, 31, 32 are disposed in the front section of the flow guiding body 20, and circulating flows are generated around the wings 30, 31, 32. That is, as shown in Figure 22B, a circulating flow Γ heading towards the stern of the ship is formed around the first wing 30 on the water passage 35 side of the wing surface 30c, and heading towards the bow section of the ship on the opposite side of the wing surface 30d. In such a case, on the water passage 35 side of the wing surface 30c, flow velocity is increased by the addition of the circulating flow Γ to the water stream 40, thereby the flow velocity along the inclined surface 24 is increased and the static pressure at the negative pressure region 41 is further reduced. Therefore, the pressure gradient force on the fluid in the fluid passage 36 is increased, and a large amount of air (bubbles) is ejected into the water.

1 **Claim 14** (currently amended): A friction reducing
2 ship, that reduces frictional resistance by ejecting gas
3 bubbles on a submerged surface of a ship body, comprising:
4 a negative pressure forming section protruding from
5 the submerged surface for creating a negative pressure
6 region in a water relative to a gaseous space;
7 a detaching promotion section for forming a water flow
8 at the negative pressure region having locally severe
9 vortices;
10 a discharge opening disposed in a rear of the negative
11 pressure forming section for ejecting gas bubbles towards
12 the negative pressure region in the water;
13 a fluid passage having one end open to the gaseous
14 space and having other end open in the water by way of the
15 discharge opening so as to direct a gas from the gaseous
16 space into the water; and
17 a gas supply apparatus for supplying the gas towards
18 the negative pressure region,
19 wherein the gas in the gaseous space is substantially
20 at atmospheric pressure.

1 **Claim 15** (currently amended): A method for reducing
2 frictional resistance by ejecting gas bubbles on a
3 submerged surface of a ship body by creating in a water a